Roadside Barriers

Data Collection User's Guide

March 2009

This guide has been prepared for use by the Transportation Development Division in coordination with Technical Services Branch and Roadway Engineering. The information contained in this manual was acquired from a variety of sources. These sources include the links provided throughout the document and the individuals listed below. Sincere gratitude is extended to these individuals for their support in the compilation of this document.

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INTRODUCTION

In an effort to monitor inventory condition and asset performance, Oregon Department of Transportation (ODOT) has adopted Asset Management principles for a proactive approach to stewardship of transportation infrastructure. Asset Management is a systematic and strategic approach to maintain, upgrade, and operate physical assets. In order to maximize the benefits of Asset Management, a standardized method of data collection and data processing is needed. This will not only benefit the individual asset managers, but will also create "corporate" data that can be used by all ODOT employees. Commonly understood corporate data will allow for informed decision-making, as well as better communication between asset managers and other ODOT departments (e.g., Maintenance, Construction, GIS). Data collection standards will lay the foundation for a regular cycle of communication about asset needs and conditions.

In January 2007, the draft ODOT Asset Management Region 2 Pilot Report was produced. This report documented experiences over the course of the previous year in collecting, integrating and reporting data about a variety of assets within specific highway segments. The state of available data for the assets included ranged from zero to well-established management systems. Research was done to analyze the data collection process, resources used, and condition of those assets that lacked previously existing data. Among the findings of the Pilot Report were recommendations specific to the assets included in the report, the methods and tools for data collection, and the quantity of data needed to build capacities for informed decisions.

The purpose of this guide is to assist ODOT employees and outside contractors in gathering roadside barrier inventory information and to maintain a consistent data collection method throughout the state. A commitment to utilize the definitions, processes, and procedures contained in this manual is an important step in moving the agency forward.

The dedication to Asset Management principles by ODOT will foster the development of strategic methods to evaluate asset data and communicate asset needs. This system will prove beneficial throughout the agency in ways such as:

- provide reliable and accurate asset information;
- ensure that public agency activities are consistent with existing federal guidelines, current accounting practices, such as *Governmental Accounting Standards Board (GASB) Statement 34;* and
- helps ODOT as an agency demonstrate to the public that they are responsible stewards of Oregon's transportation assets.

Basic Inventory

Before Inventory Begins

Before collecting inventory, you will first need to do the following:

- Identify the segment of roadway to be inventoried with Team Lead.
- Obtain access to the Roadside Barrier Data Collection Sheet (see Appendix C).
- Acquire fundamental working knowledge of the Digital Video Log (DVL).
    - You can access the DVL's User's Guide, at the following website: *http://intranet.odot.state.or.us/cf/dvl/DigitalVideoLog_Instr.htm*
    - The following link provides access to a list of the available video logs: *http://www.oregon.gov/ODOT/TD/TDATA/rics/docs/Videolog_Data_Available.pdf*
- Familiarize yourself with the Field Inventory Manual compiled by Road Inventory & Classification Services (RICS). To do this you will need to contact someone in the RICS unit to request a copy. The RICS website is: *http://www.oregon.gov/ODOT/TD/TDATA/TDATA_All_Contacts.shtml#Road_Inventory___Classification_Services*
- Familiarize yourself with the terminology (e.g., milepoints, add direction, non-add direction, roadway ID). You will need to be familiar with the terms and their definitions found both in the Field Inventory Manual, and those listed on the Transportation Development Division's website under the ITIS entity definitions: *http://www.oregon.gov/ODOT/TD/TDATA/otms/OTMS_ITIS_Field_Definitions.shtml*
- Review the list of commonly used terms (see *Appendix A*)
- Fill out the Asset Data Collection Registry Form (see *Appendix B*)

Print a copy, or have access to, the Highway Inventory Summary Report for the relevant segment of highway you are inventorying before you head out into the field (see *Appendix E*). Visit the following website to search for reports according to highway number: *http://highway.intranet.odot.state.or.us/cf/highwayReports/aml_summary_parms_by_route_no.cfm*

Steps for Collecting Roadside Barrier Inventory

1. Procure a "Barrier_Data_Collection_Sheet_Hwy.xls" (as an excel spreadsheet document), located at: *\\Scdata\rdwyshar\Roadside_Barriers.*
   Note: You will need to be sure you have access to this drive and folder.
2. Using the Digital Video Log (DVL), search for roadside barriers along highways and then enter the following information in the appropriate column on the spreadsheet.
   a. Location
      i. Route Number
      ii. ODOT Highway Number
      iii. Roadway ID
      iv. Mileage Type
      v. Overlapping Mileage
      vi. Milepoints
      vii. Side of Road
   b. Beginning Terminal
      - Identify and record attributes
        i. Type
           1. Terminal
           2. Impact Attenuator (Crash Cushions)
           3. Transition
           4. Continuation
        ii. Height
        iii. Condition
   c. Roadside Barrier Type (either i, ii, or iii)
      i. Guardrail
         - Identify and record attributes
           1. Rail Type
           2. Post Spacing
           3. Post Type
           4. Height
           5. Condition
      ii. Cable Barrier
         - Identify and record attributes
           1. Cable Barrier Type
           2. Height
           3. Condition
      iii. Concrete Barrier
         - Identify and record attributes
           1. Concrete Barrier Type
           2. Construction Method
           3. Connections
           4. Height
           5. Condition
   d. Ending Terminal (follow the steps listed under b.)
   e. Record the year inventory was collected
3. Field verify when and where appropriate (i.e., when conditions are safe to do so).

Roadside Barrier Data Collection Spreadsheet

The data collection spreadsheet is used as the tool for recording and storing inventory data. You will enter the inventory data you collect into the appropriate column on the spreadsheet. The information contained in this manual is ordered in the same manner as the columns on the spreadsheet. Displayed below is an example of the data collection spreadsheet. The sections shown here are exact duplicates of the columns you will find on the spreadsheet. The green lines indicate the table was broken and the columns to the right were moved below. The top section of columns is found at the far left of the spreadsheet and the bottom section of columns is found at the far right of the spreadsheet. A list of abbreviations for data entry can be found in Appendix I.

Route Number	ODOT Highway Number	Roadway ID	Mileage Type	Ovlap_ mlge_cd	Beginning Mile Point (to 100th)	Ending Mile Point (to 100th)	Side of Road (R/L/C)

Beg_Term_ Type	Beg_Term_ Height (L, O, H)	Beg_Term_ Cond (G,F,P)	Rail_Type	Post_ Spacing	Post_Type	Rail_Height (L, O, H)	Rail_Cond (G,F,P)

Cable_Bar_ Type	Cable_Bar_ Height (L, O, H)	Cable_Bar_ Cond (G, F, P)	Bar_Type (Jersey, F, Tall F, SS)	Bar_Const_ Mthd (Precast, CIP)	Connection	Bar_Height (L, O, H)	Bar_Cond (G,F,P)

End_Term_Type	End_Term_Height (L, O, H)	End_Term_Cond	Comments	Inventory Year

Inventory Definitions & Photographs

Location: This refers to the information that is needed in order to geographically reference where each roadside barrier is located. The goal is to use this information to map the location of roadside barriers along roadways.

Route Number	ODOT Highway Number	Roadway ID	Mileage Type	Ovlap_ mlge_cd	Beginning Mile Point (to 100th)	Ending Mile Point (to 100th)	Side of Road (R/L/C)

Route Number – Also known as Route ID. This is an alpha-numeric code which is commonly known to the public that identifies the highway (e.g., US 101). When multiple route numbers are located on one highway the rule for identifying the route ID is as follows: always use the interstate number when present; otherwise, use the US number; if neither are present use the lowest OR number.

ODOT Highway Number – A three digit state number (not route number) used by ODOT assigned to a length of highway for specific use in the Integrated Transportation Information System (ITIS) database. Valid highway numbers range from 001 to 456. Each connection (i.e., ramp) or frontage road will have its own unique identifying highway number which will have the same highway number as the mainline, with an additional two letters to uniquely identify a specific connection or frontage road (e.g., 001AA, 001AB).

> The "Routes | State Highway Cross Reference" report provides a list of Highway Names and their corresponding Route Numbers and Highways Numbers. The list can be viewed at: *http://www.oregon.gov/ODOT/TD/TDATA/otms/Route_H wy_CrossRef.shtml,* However, some of the highways have more than one route number, for this list see Appendix F.

Roadway Identifier (Roadway ID) – Also known as Roadway ID. This is a one digit code used in conjunction with the highway number and milepoint to identify the alignment on which the roadside barrier being inventoried exists. The roadway ID ranges in value from 1-5, however, when collecting roadside barrier inventory data the only numbers you will use are 1 and 2. The number 1 is used for all roads that are not considered divided highways, as well as, for the add direction of divided highways. The number 2 is used for the non-add direction of divided highways. ***Note:*** I-5 is the exception to this rule; see Figures 1 and 2 below.

Mileage Type – This is used to make milepoints unique in areas where there are multiple occurrences of a milepoint on a single highway. Mileage types are identified as follows:

- Regular mileage is left blank
- Temporary mileage is identified with a "T"
- Spurs are identified with a "Y"
- Overlaps are indicated with a "Z". Example: Z-mileage refers to a section of road that has been lengthened in the middle due to realignment.

Overlapping Mileage Code (Ovlap_Mlge_Cd) – This is used only in conjunction with "Z" mileage. The first chronological occurrence of 'Z' mileage will have an overlapping mileage code of 1, the second occurrence will have a overlapping mileage code of 2, etc. Overlapping mileage occurs when a section of highway is lengthened in the middle due to a realignment. Example: Section of highway from milepoint 49.00 to milepoint 50.00 is washed out. The washed-out section must be replaced, but old alignment cannot be used. A new alignment is built around problem area, but new alignment is 4.62 miles longer than original alignment. New distance between milepoint 49.00 and milepoint 50.00 is now 5.62 miles. To reflect true distance along the highway without renumbering all of the milepoints along the entire road, "overlapping mileage" is created.

Milepoint – A number that represents the distance in miles from the original beginning of the highway. This distance, measured along the contours of the traveled roadway, is derived from construction plans and field inventory. For the purpose of collecting roadside barrier inventory record the beginning and ending milepoints, to the hundredth decimal place (.01), of each roadside barrier according to the milepoint log on the DVL, or the DMI when in the field.

Side of Road – Refers to the location along the highway. This is identified as Left (L), Right (R), or Center (C) based on the "Add" mile direction.

Figures 1 and 2 depict Roadway ID, and Side of Road for divided highways.

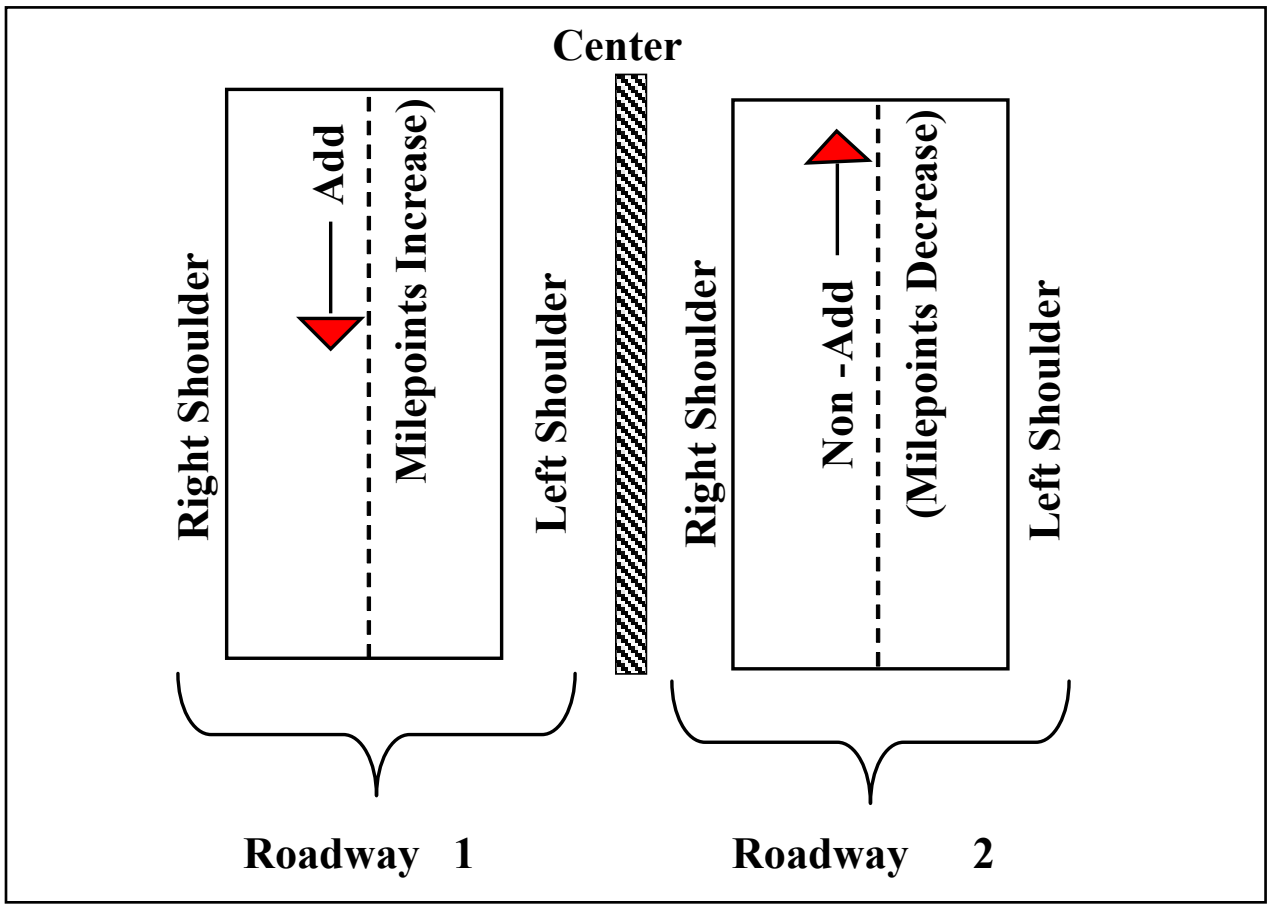


Figure 1. All Highways <u>Except</u> I-5. Add mileage for standard highways occurs in the south and east directions

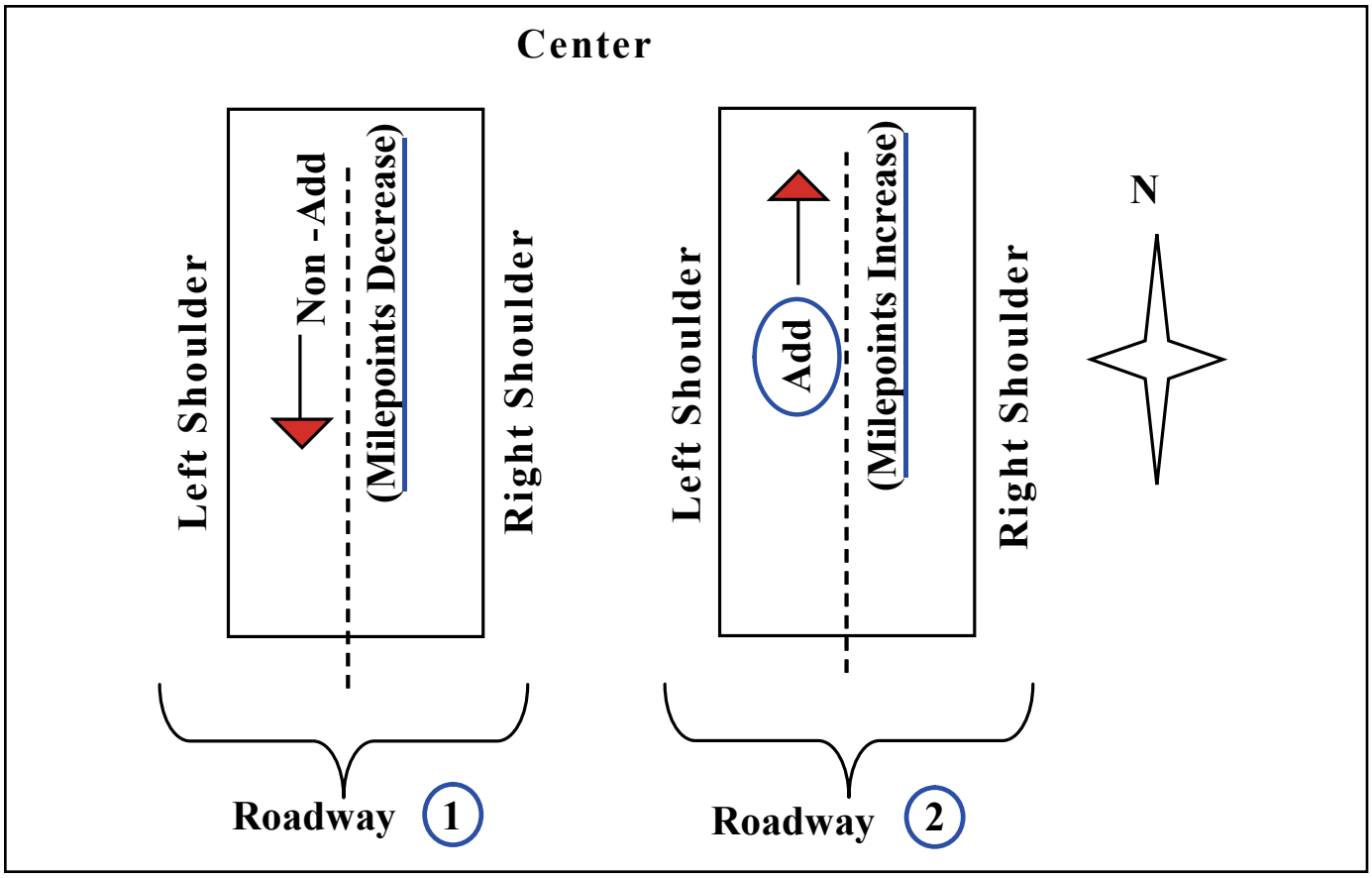


Figure 2. I-5 Only

TERMINALS: These are the very ends of the barriers. The different types are as follows: **terminal**, **impact attenuator** (a.k.a. crash cushion), **transition**, and **continuation**. When gathering inventory data you will need to identify the type of terminal located at both the beginning milepoint (Beg_Term_Type), and ending milepoint (End_Term_Type) of the roadside barrier. You will also need to identify the height and condition for both of the roadside barrier terminals. If something stands out as pertinent information, be sure to make a note of it in the "Comments" column.

Beg_Term_ Type	Beg_Term_ Height (Low, OK, High)	Beg_Term_ Cond (G,F,P)		End_Term_ Type	End_Term_ Height (Low, OK, High)	End_Term_ Cond	Comments

Terminal – A barrier terminal that is **not** a transition, a continuation, or an impact attenuator, but simply the terminus of the barrier.

None - No terminal is present.

Sloped End Unburied – End slopes down toward the road.

Buried in Mound – End is buried in a man-made mound of earth.

Buried in Back Slope – End is buried into the slope of the land (i.e., side of hill).

Blunt A – The terminal has a blunt end that resembles a shovel head. Second post is <u>not</u> breakaway there is no hole drilled in post *(see ET 2000)*.

Blunt B – Similar to the Blunt A but the end is a bit more rounded. Second post is <u>not</u> breakaway *(see ET 2000)*.

Blunt C – The end piece wraps all the way around to the back of the rail. Second post is not breakaway *(see ET 2000)*.

Thrie B – The terminal has a blunt end that is slightly rounded. Similar to Blunt B for w-beam.

SKT 350 (Sequential Kinking Terminal) – Characterized by a center horizontal brace and two vertical braces.

ET 2000/ET 2000 Plus – Has a flat end that is perpendicular to the road. All posts are drilled to breakaway; and there is a ground strut.

SRT 350 (Slotted Rail Terminal) – All posts are drilled to breakaway, and the system has a ground strut (represented in the picture on the left). There are pre-formed slots cut in the rail (see the picture on the right).

Turned-Down-End (Texas Twist) – The end is dropped down, and buried into the ground. The end may be rotated (i.e., twisted) or not.

BCT (Breakaway Cable Terminal) – Terminal head has various forms. The **first two posts are drilled** to be breakaway *(see ET 2000)*. A **cable** connects the back of the rail with the first post.

FLEAT (Flared Energy Absorbing Terminal) – The terminal head has a straight flare, and is 37′ 6″ in length. There is a **tube bracket on top** of the terminal.

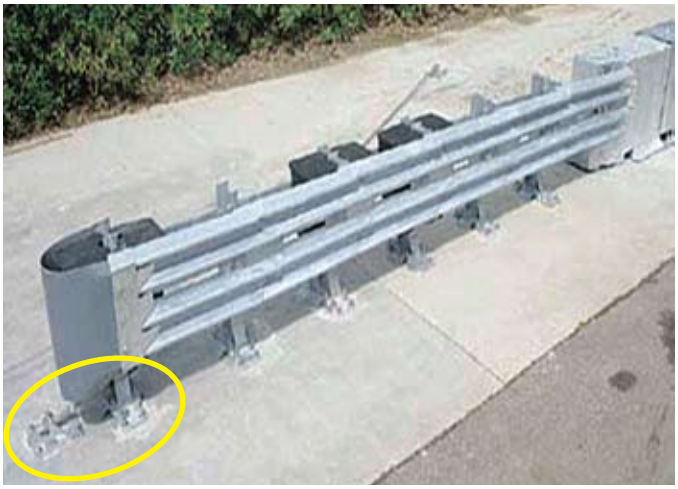
Cable Barrier Terminal – The cable strands are brought down and anchored to the ground. The photos above show a couple of varieties.

<u>Impact Attenuator (Crash Cushion)</u> – This is a terminal used to shield a point hazard; where it is not effective or practical to use a longitudinal barrier, or to place a terminal end on a median barrier. The main element for identifying an impact attenuator is to match what you see on the DVL, or in the field, with one of the pictures below. An impact attenuator can be attached to a roadside barrier (i.e., a guardrail, cable barrier, or concrete barrier), or it can stand alone.

If the impact attenuator is attached to a roadside barrier follow the same guidelines used for all other terminals when recording inventory data.

If the impact attenuator is an independent feature (i.e. connected to a structure), it is to be treated as a point rather than a segment and it will only be designated by a beginning milepoint (do <u>not</u> record an ending milepoint). For a stand alone impact attenuator you will only populate the columns pertaining to location and beginning terminal.

Sentre – The system contains a **cable and anchor,** thrie rail side panels, and sand-filled boxes set into the middle. Can be installed as a straight (parallel to roadway) or flared (angled) unit.



QuadTrend – The system is very similar to the Sentre in that it contains a **cable and anchor,** and sand-filled boxes set into the middle. The distinguishing characteristic is the quad-rail side panels with slots.

QuadGuard – The side panels are made of quad rail and the modules inside are similar to those used in the GREAT and Hex-Foam Sandwich.

QuadGuard Elite – Similar to the QuadGuard, except, the system has cylinders made of high density polyethylene plastic.

TRACC (Trinity Attenuating Crash Cushion) – Similar to the QuadGuard in that the side panels are made of quad rail; but, unlike the QuadGuard, there are no modules.

SCI 100 GM – Characterized by 4 evenly spaced ridges along the sides. There are no modules inside, but there is a cable located at the bottom of the attenuator.

Hex-Foam Sandwich – The attenuator has crushable modules in the center. There are deflective panels on the sides that telescope upon impact.

GREAT (Guard Rail Energy Absorbing Terminal) – The sides telescope and are made of thrie rail. The modules inside are similar to the type used in Hex-Foam & QuadGuard.

Hi-Dro Sandwich System – Contains rubber tubes filled with water to absorb the crash.

Sand Barrels – Consists of multiple barrels filled with sand organized in front of a hazard.

REACT – Polyethylene tubes (barrels) that flatten out in a hit and then open back up. ***Note:*** Need to identify the number of barrels.

CAT 350 (Crash Cushion Attenuating Terminal) – Posts are drilled for easy breakaway. There are perforations in the rail, and it has a ground strut.

Brakemaster – This attenuator telescopes when hit and is characterized by the braking mechanism located in the head of the barrier.

QUEST – Characterized by two round steel pipes angled down at the front of the unit. There is also a round tube set longitudinally along the bottom.

TAU II, Narrow – Has three ridges and round energy absorbing cartridges placed inside.

TAU II, Wide – Same as the TAU II, Narrow, except for its increased width.

Transitions – Refers to the connection between two roadside barriers, or a roadside barrier and another structure (e.g., bridge rail). Note: When one transition connects two roadside barriers it is labeled as the end of one, and the beginning of the other.

Pre 230 – Attached with w-rail (2 crests, 1 trough). It is the only transition without thrie rail. See "Rail Type" under guardrails for a close-up picture of w-rail/w-beam.

230 – Attached with thrie rail (3 crests, 2 troughs) and post spacing of 3′ 1½″. *See "Rail Type" under guardrail for a close-up picture of thrie rail.*

350 – Attached with thrie rail *(see transition 230)* and post spacing of 18.75″ (1′ 6¾″).

Connected to Structure – Refers to a concrete barrier that connects directly to a structure (e.g., a bridge rail).

Cable Barrier Guardrail Connection – The cable is connected through the guardrail and anchored to the back.

Continuation – Refers to a roadside barrier with a beginning and/or ending milepoint on a side road or ramp. An explanation for how to properly collect inventory data for continuations is provided after the definition of each type of continuation listed below.

Continues down Offramp – Roadside barrier begins on a mainline and ends on a ramp. When collecting inventory you will need to fill in two lines of data: 1) For the portion of the barrier located on the mainline do the following: identify the beginning milepoint and the beginning terminal of the barrier on the mainline in the usual way; the ending milepoint on the mainline is determined from the Highway Inventory Summary Report as the milepoint that the ramp leaves the mainline; the "End_Term_Type" is recorded as "Cont down offramp" (fill in the appropriate alpha-numeric code in the comments column -103AA). 2) For the portion of the barrier located on the ramp do the following: use the Highway Inventory Summary Report to determine the ramp milepoint numbers; identify the beginning milepoint of the barrier on the ramp by writing in the ramp milepoint at which the ramp leaves the mainline; the "Beg_Term_Type" will be listed as "Cont from side road" (fill in the appropriate ODOT highway number in the comments column); list the ending milepoint of the barrier as the ramp milepoint where it ends; and fill in the "End_Term_Type" in the usual way.

Below is a sample of the relevant columns to look at in the Highway Inventory Summary Report, and an example of how you use it to determine the ramp milepoint for the place where a ramp leaves a mainline. The mainline milepoint number is highlighted in blue and the ramp milepoint number is highlighted in yellow.

Roadway	Mileage Type	Overlap Code	Mile Point	Dup	Roadway Codes					Description
1			307.76		S	=	1			001VT CONN. M.P. 5C307.76

Continues from Onramp – Roadside barrier begins on a ramp and ends on a mainline. When collecting inventory you will need to fill in two lines of data: 1) For the portion of the barrier located on the ramp do the following: use the Highway Inventory Summary Report to determine the **ramp** milepoint numbers; identify the beginning milepoint of the barrier on the ramp using the appropriate ramp milepoint number; fill in "Beg_Term_Type" in the usual way; list the ending milepoint for the barrier on the ramp as the ramp milepoint at which the ramp connects to the mainline; identify the "End_Term_Type" as "Cont down side road" (fill in the appropriate ODOT highway number in the comments column). 2) For the portion of the barrier located on the mainline do the following: identify the beginning milepoint of the barrier on the mainline from the Highway Inventory Summary Report as the place where the ramp connects to the mainline; the "Beg_Term_Type," will be listed as "Cont from onramp" (fill in the appropriate alpha-numeric code in the comments column -103AB); the ending milepoint on the mainline and the end terminal are determined in the usual way.

Continues down Side Road – A roadside barrier that begins on a mainline and ends on a side road. When collecting inventory you will fill in the beginning milepoint based on where the barrier begins and ending milepoint based on where the side road intersects the mainline. Then, for the "End_Term_Type" column you will fill in "Cont down side road." ***Note***: Need to write down the actual road name (if known), or highway number in the "Comments" column of the spreadsheet.

Continues from Side Road – A roadside barrier that begins on a side road and ends on a mainline. When collecting inventory you will fill in the beginning milepoint and ending milepoint columns based on where the barrier begins and ends on the mainline. Then, for the "Beg_Term_Type" column you will fill in "Continues from side road." ***Note***: Need to record the actual road name or highway number the barrier continues from (if known) in the "Comments" column of the spreadsheet.

Height – Refers to the distance measured from the road surface to the top of the terminal. This will not be a precise measurement; instead, it will be given a classification of **Low**, **OK** or **High**. The height assessment is made with relation to the standard height of the terminals. The initial height assessment should be made with your best judgment while using the DVL, then field verified. ***Note:*** Sometimes there are objects on the screen that can provide a good reference for measurements.

- **Low** – A terminal should be classified as low when it is noticeably lower than the standard height, or when it visually stands out as appearing short.
- **OK** – The terminal has been properly installed according to the standards, and it meets the height requirements. Typically impact attenuators that meet the "OK" classification are between 2′ 4½″ and 2′ 8½″.
- **High** – The terminal has been incorrectly installed and is higher than the standard, or when it visually stands out as appearing high in height. There should not be many terminals fitting the "high" category.

Physical Condition – This refers to an assessment of the overall appearance of the terminal. It is to be classified as **Good**, **Fair** or **Poor.** The initial condition assessment should be made when using the DVL, and then verified when in the field.

- **Good** – Appears to have been correctly installed, and there are no visible indications of impact.
- **Fair** – Appears to have been correctly installed, but there are signs of impact which have not rendered the terminal ineffective (e.g., dents, misshapen end, misshapen rail).
- **Poor** – Obvious signs of incorrect installation, or impact that has rendered the barrier non-functional (e.g., broken terminal end, missing or broken posts).

Roadside Barrier Type: This refers to the portion of the barrier located between the beginning and ending terminals. As you can see by the section of spreadsheet columns displayed below a roadside barrier fits one of three types: guardrail, cable rail, or concrete barrier. When inventorying this portion of the roadside barrier you will only fill in the columns in one of these three sections, not all.

Rail_ Type	Post_ Spacing	Post_ Type	Rail_ Height (L, O, H)	Rail_ Cond (G, F, P)	Cable_ Bar_Type	Cable_ Bar_ Height L, O, H)	Cable_ Bar_ Cond (G, F, P)	Bar_Type (Jersey, F, Tall F, SS)	Bar_ Const_ Mthd (Precast, CIP)	Connection	Bar_ Height (L, O, H)	Bar_ Cond (G, F, P)

Guardrails: These are the roadside barriers where the horizontal sections are not made of concrete or cable. For these roadside barriers, you will need to collect information for the spreadsheet columns displayed below.

Rail_Type	Post_Spacing	Post_Type	Rail_Height (L, O, H)	Rail_Cond (G, F, P)

Rail Type – This refers to the horizontal portion of the guardrail.

A **W-Beam** rail is Characterized by having two distinct waves (2 crests, 1 trough).

W-Beam Galvanized – A w-beam that has been coated with rust-resistant zinc.

W-Beam Painted – A w-beam with a paint finish.

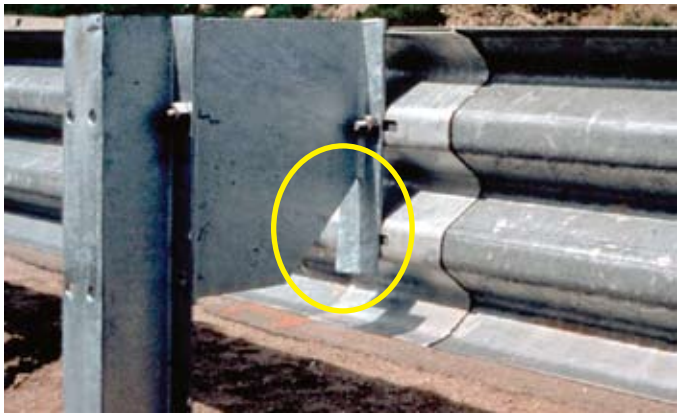
W-Beam CORTEN (Rusty Rail) – This refers to the use of weatherized steel, which has a "weathered" or "natural" appearance.

Half Moon – The rail is shaped like a half-circle. It does not have the typical ridges other guardrails do.

W-Beam with Rub Rail – As shown in the picture, this system has a w-beam with the addition of a rail along the bottom (rub rail). The purpose of this rub rail is to prevent vehicle tires from snagging on the posts in the event of a crash.

Flying W – Characterized by a "wing" on each side of the guardrail; hence the name.

Thrie – Characterized by having three distinct waves (3 crests, 2 troughs).



Modified Thrie – Characterized by the notch in the block-out.

Round Timber – The rail is made of round timber and has steel backing.

Steel Backed Timber – Rectangular prism shaped timber with steel backing.

Two Rail Steel Backed Timber – Same as the Steel Backed Timber rail, but with the addition of a second rail.

<u>Post Spacing</u> – This refers to the measurement in feet and inches of the space between the posts that anchor the guardrail to the ground.

Type 1 – Characterized by 12′ 6″ spacing of posts and no block-outs *(see picture on left below)*.

Type 1A – Characterized by 12′ 6″ spacing with block-outs.

Type 2 – Characterized by 6′ 3″spacing of posts and no block-outs.

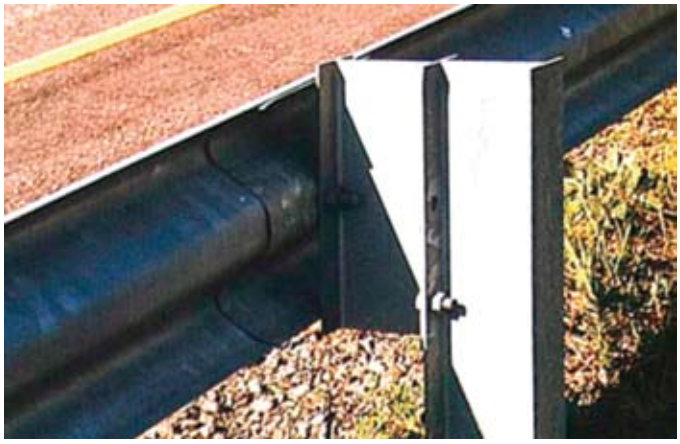
Type 2A – Characterized by 6′ 3″ spacing of posts with block-outs *(see picture on right below)*.

Type 1

Type 2A

Post Type – This refers to the material the posts are made of. Once you have identified the rail type, you will then need to collect data on the posts that connect the guardrail sections together and anchor the roadside barrier to the ground. You will need to identify both the material of the posts - **Wood, Steel**, or **Concrete** - and, if present, note the material of the block-outs (**Wood, Steel,** or **Plastic**) in the "Comments" column. The block-outs are the pieces of material between the rail and the post that are found on some guardrails.

Wood Posts with **Wood Block-outs.**



Steel Posts with **Steel Block-outs**. You may also find steel posts with plastic or wood block-outs.

Concrete Posts with no block-outs.

Height – Refers to the distance measured from the road surface to the top of the rail. This will not be a precise measurement; instead, it will be given a classification of **Low**, **OK** or **High**. Assessing the height is done with regard to ODOT standards. The standard height for a w-beam rail is 2′ 4½″, and the standard height for a thrie rail is 2′ 8½″. The initial height assessment should be made with your best judgment using the DVL and then field verified. ***Note:*** Sometimes there are objects on the screen that can provide a good reference for measurement.

It is important to keep in mind that while the standards listed here are current as of August 2008, these standards can change. The current standards at any given time can be found on the ODOT Standard Drawings Page at: *ftp://ftp.odot.state.or.us/techserv/roadway/web_drawings/roadway/rev_13/pdf/rd400.pdf.*

Low – A guardrail should be classified as low when it is lower than the standard height, or visually stands out as appearing short in height.

OK – The guardrail has been properly installed according to ODOT standards, and it meets the height requirements.

High – The guardrail has been incorrectly installed and is higher than the standard, or when it visually stands out as appearing high in height. ***Note:*** There should not be many guardrails fitting this category.

Physical Condition – This refers to an assessment of the overall appearance of the traffic barrier. It is to be classified as **Good**, **Fair** or **Poor.** The initial condition assessment should be made when using the DVL, and then verified when in the field.

Good – Appears to have been correctly installed, there are no visible indications of impact, and no rust.

Fair – Appears to have been correctly installed, but there are signs of impact which has not rendered the barrier ineffective (e.g., bent posts, misshapen rail), and/or some rust.

Poor – Obvious signs of incorrect installation, or impact that has rendered the barrier non-functional (e.g., missing or broken post, terminal, rail), and/or significant rust.

Cable Barrier: Refers to a roadside barrier where the horizontal segments are made of steel cables. For these roadside barriers, you will need to collect information for the spreadsheet columns displayed below.

Cable_Bar_ Type	Cable_Bar_ Height (L, O, H)	Cable_Bar_ Cond (G, F, P)

Cable Barrier Type

3-Strand Cable Rail – Refers to a cable rail system that has three strands of cables.

4-Strand Cable Rail – Refers to a cable rail system that has 4 strands of cables. This will look exactly the same as the 3-strand Cable Rail picture above, but with the addition of a fourth strand of cable.

Height – Refers to the distance measured from the road surface to the bottom cable. This distance is typically 21″. This will not be a precise measurement; instead, it will be given a classification of **Low**, **OK** or **High**. Assessing the height is done with regard to ODOT standards. The initial height assessment should be made with your best judgment using the DVL and then field verified. ***Note:*** Sometimes there are objects on the screen that can provide a good reference for measurement.

Physical Condition – This refers to an assessment of the overall appearance of the traffic barrier. It is to be classified as **Good**, **Fair** or **Poor.** The initial condition assessment should be made when using the DVL, and then verified when in the field.

Good – Appears to have been correctly installed, and there are no visible indications of impact.

Fair – Appears to have been correctly installed, but there are signs of impact which has not rendered the barrier ineffective (e.g., bent posts, misshapen cable, etc.).

Poor – Obvious signs of incorrect installation, or impact that has rendered the barrier non-functional (e.g., missing or broken post, terminal, cable strand, etc.).

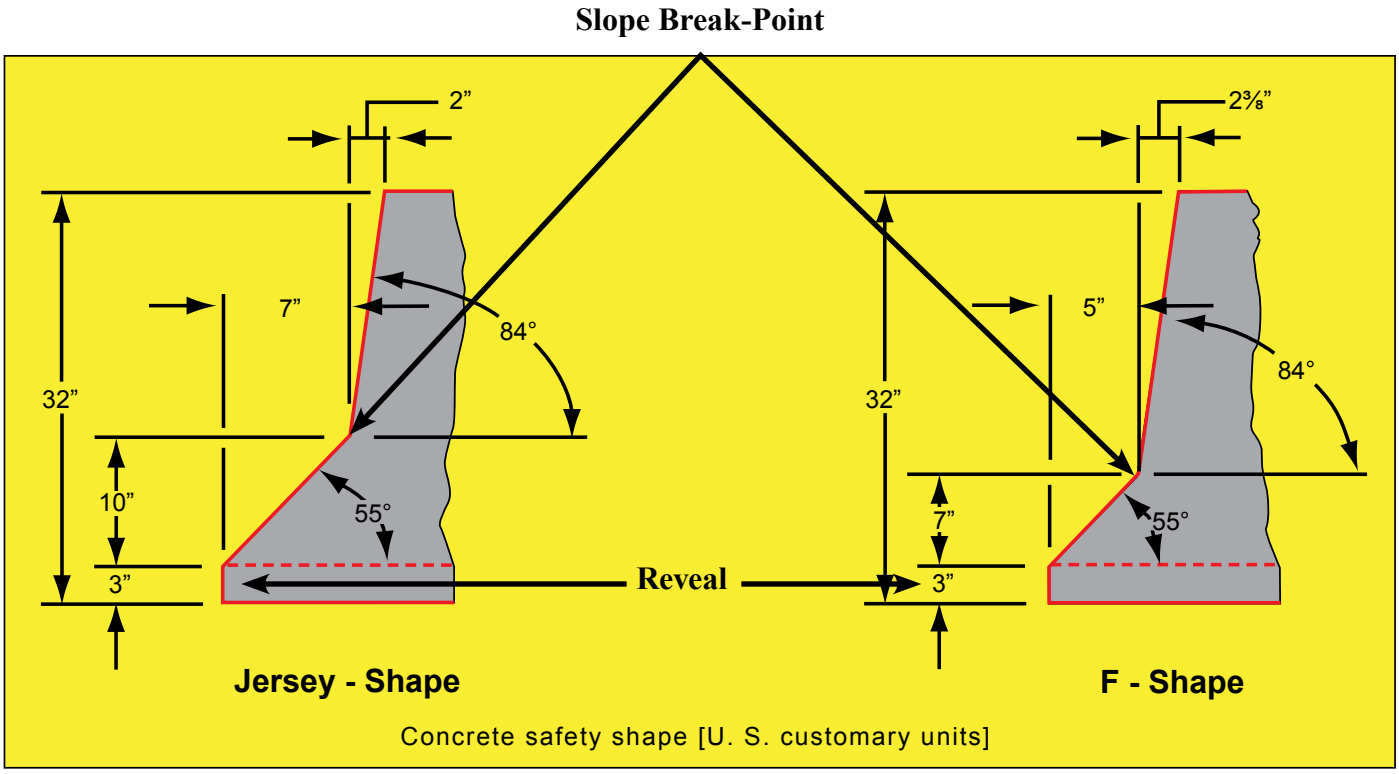
Concrete Barriers: These are the roadside barriers where the segments are made entirely of concrete. For these roadside barriers you will need to collect information for the spreadsheet columns displayed below.

Bar_Type (Jersey, F, Tall F, SS)	Bar_Const_Mthd (Precast, CIP)	Connection	Bar_Height (L, O, H)	Bar_Cond (G, F, P)

Concrete Barrier Type

New Jersey (Jersey) – Characterized by the slope break-point (where the lower sloped face meets the steeper upper slope) being 13″ above the pavement. Minimum height of 32″.

F-Shape – While similar at first glance to the Jersey barrier, the F-shape barrier has its slope break-point only 10″ above the pavement. Minimum height of 32″.



Tall F-Shape – Identical to the F-Shape except the barrier is 42″ tall instead of 32″.

Single Slope – Characterized by one continuous slope (no break point) and a height of 42″. *See Cast in Place and Precast below for pictures of Single Slope barriers.*

Construction Method – Refers to the method used to construct the concrete barriers and place them in location.

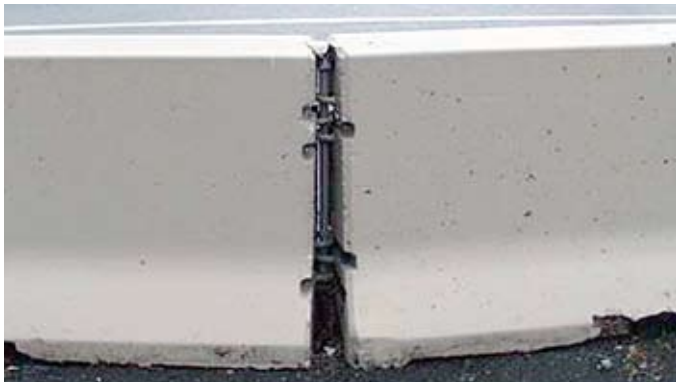
Cast in Place – The barrier is formed on site, and has contraction joints every 15' and expansion joints every 90'. The picture above is of a Single Slope, Cast in Place concrete barrier.

Precast – The barrier is formed off site and transferred to location in 10' sections. A precast concrete barrier will have one of the connections listed in the following section. The picture above is of a Single Slope, Precast concrete barrier.

Connection – Identifies the type of connection used to hold the precast sections of concrete barriers together. This does not apply to cast in place concrete barriers.

Tongue & Groove – Sections fit together with a lengthwise protuberance or *tongue* which extends out on one side and fits into a channel or *groove* on the opposite side.

Bolted "C" Channel Connection – Used only on the Tall F-Shape and Single Slope barriers. It is characterized by four opposing "C" channels locked together by a 1" diameter bolt.



Pin & Loop – Used on NJ and F-Shape Barriers. Barrier sections are held together by a pin that is placed between either 4 or 6 loops. The loops can be made of cable or rebar. If possible, note the number of loops and the material they are made of in the "comments" column of spreadsheet.

Height – Refers to the distance, measured in inches, of the concrete barrier from the road surface to the top of the barrier. This will not be a precise measurement; instead, it will be given a classification of **Low**, **OK**, or **High**. The height is determined by comparing the actual height of the barrier to the ODOT standards for height mentioned in the description of each concrete barrier type. The initial height assessment should be made with your best judgment using the DVL and then field verified. ***Note:*** Sometimes there are objects on the screen that can provide a good reference for measurements.

- **Low** – NJ, F, and Tall F are low if the road surface covers MORE than the bottom "reveal" segment of the barrier (i.e., the bottom 3″). Single Slope is low if the height is less than 32″ (i.e., more than 10″ below the standard 42″ height).
- **OK – If barrier meets the standard 32″ or 42″ (depending on type).**
- **High** – There will not be any barriers fitting this category.

Physical Condition – This refers to the overall appearance of the traffic barrier. It is to be classified as **Good**, **Fair**, or **Poor.** The initial condition assessment should be made when using the DVL, and then verified when in the field.

- **Good** – Appears to have been correctly installed, and there are no visible indications of impact.
- **Fair** – Appears to have been correctly installed, but there are signs of impact which has not rendered the barrier ineffective; such as a barrier that appears to be out of alignment as in the picture on the right of the Pin & Loop connections.
- **Poor** – Obvious signs of incorrect installation, or impact that has rendered the barrier non-functional (e.g., cracks or breaks in the barrier).

FUNCTIONAL CONDITION: This refers to the overall condition – referencing both the physical condition and the standard/substandard condition – of the entire roadside barrier. This assessment is used for reporting, maintenance and project purposes. It is not necessary to determine the functional condition of roadside barriers when collecting basic level inventory. ODOT's Roadway Engineering Division in collaboration with the Audit Services Division developed the functional classifications found in *Appendix H* based on the FHWA standards. This information is current as of August 2008; however, please keep in mind that these standards are changing frequently. For more information visit the following webpage on FHWA's website: *http://safety.fhwa.dot.gov/roadway_dept/road_hardware/road_policies.htm*.

Procedures for Storing, Uploading & Accessing Roadside Barrier Information

Storing Inventory Data

Roadside barrier inventory data will be stored in the same excel spreadsheets used to collect the inventory data, and saved under the following network folder: *\\Scdata\rdwyshar\Roadside_Barriers.* When saving a spreadsheet to this folder be sure **not** to save over the master spreadsheet, "Barrier Data Collection Sheet.xls." Instead, you should rename the spreadsheet by adding the ODOT Highway Number for the road inventoried to the end of the spreadsheet name, e.g., "Barrier_Data_Collection_Sheet_HWY103.xls."

Uploading Data into Database

Roadside barrier inventory data will be uploaded into the corporate database by the Road Inventory and Classification Services (RICS) division. Please check with your supervisor to find out how to deliver the inventory data to RICS.

Accessing Data

Currently, data can be accessed through the network folder, *\\Scdata\rdwyshar\Roadside_Barriers.* However, once the data is uploaded into the corporate database, it will be necessary to request a report from Road Inventory & Classification Services Unit (RICS) in order to view information based on the inventory data contained in the database. Please allow 10 working days for reports to be generated.

Frequently Asked Questions

1. **Why do we need to inventory roadside barriers?**

   As ODOT moves toward an asset management approach, it is important that we have an accurate record of the existing transportation infrastructure. ODOT needs to know what type, and how many roadside barriers are present on the highways. This information will help ODOT maintain and upgrade assets in a cost-effective way. In addition, maintaining a record of current inventory data is also important for funding purposes.

2. **What is the difference between an "ODOT Highway Number" and the highway "Route Number"?**

   An ODOT highway number is a three-digit ODOT number that is assigned to a length of highway. This number is used by ODOT transportation staff as a referencing system to identify a particular road for inventory or research purposes. A route number is assigned to a particular route (e.g., interstate route, US route, OR route) and is used to follow a particular path through a road network. This route number is mainly used by drivers for traveling purposes.

3. **What is the Highway Inventory Summary Report?**

   This is a report detailing the milepoint locations of roadway features. This report is run by accessing TransViewer online; which is continually updated by ODOT's Road Inventory and Classification Services (RICS) Unit (see *Appendix E*).

   TransViewer Website: *http://highway.intranet.odot.state.or.us/cf/highwayReports/aml_summary_parms_by_route_no.cfm*

4. **How do I determine milepoint information for a ramp?**

   By using the Highway Inventory Summary to run a report for the section of roadway you are inventorying. Below is sample of the relevant columns to look at in the Highway Inventory Summary Report, and an example of how you use it to determine the ramp milepoint for the place where a ramp leaves a mainline. The mainline milepoint number is highlighted in blue and the ramp milepoint number is highlighted in yellow. For more information see *Appendix E.*

Roadway	Mileage Type	Overlap Code	Mile Point	Dup	Roadway Codes					Description
1			307.76		S	=	|			001VT CONN. M.P. 5C307.76

5. **What should I do when there are multiple roadside barriers in one location?**

   Inventory all the barriers present. If necessary use the comment field to add any additional information, such as overlapping barriers, etc.

6. **What is the best way to estimate the size of roadside barriers from the video log? (Any other estimates that might be necessary?)**

   Sometimes there are other objects in the picture which may provide a height reference, otherwise, just use your best judgment. If you are really unsure about a particular roadside barrier – or portion of one - be sure to mark "Field verify height" in the "Comments" column of the spreadsheet so you know to check the height when out in the field. Your ability to estimate height using the DVL will improve with time.

7. **How accurate does the milepoint data need to be?**

   Use the milepoint number shown on the DVL screen. The number should be identified to the second decimal place (e.g., 7.35).

8. **How should I inventory roadside barriers on sections of highway that have multiple highways that cover the same section of road?**

   Common Alignment – These are locations on the State Highway System where two different highways share the same location (i.e., they are the same road). To avoid having more than one data set with the same roadside barrier inventory information, inventory should be collected and recorded for the highway with the lowest ODOT highway number only. See *Appendix G* for a list of highways that share common alignments. Also, review the information on route numbers on *page 41* and in *Appendix F* for assistance in determining which route number to use when recording inventory data.

9. **Are there roadside barriers that we do <u>not</u> inventory?**

   Yes. We do <u>not</u> inventory traffic barriers that are part of other structures, such as bridges (e.g., bridge rails). If you're not sure if a barrier is part of another structure, collect the inventory information, make a note in the "comments" column of the spreadsheet, and make a note for yourself to check with a supervisor.

10. **What if I see something in the field that I do not know how to identify in my inventory?**

    Take a picture of the object, take note of the condition and milepoints, and ask a supervisor, or someone listed under "Contacts & Resources" for assistance.

Contacts & Other Useful Resources

Heidi Shoblom, P.E.
Roadside Safety Engineer
Technical Services Branch
355 Capitol Street NE, Rm. 222
Salem, OR 97301
(503) 986-3667
Heidi.E.Shoblom@odot.state.or.us

Steven Lindland, P.E.
Roadway Engineering Manager
Technical Services Branch
355 Capitol Street NE, Rm. 222
Salem, OR 97301
(503) 986-3557
Steven.R.Lindland@odot.state.or.us

Heather King
Road Inventory & Classification Services
Millcreek Office Building
555 13th Street NE, Suite 2
Salem, OR 97301-4178
(503) 986-4157
Heather.L.King@odot.state.or.us

Laura Hansen
Asset Management Coordinator
Asset Management Integration Section
555 13th Street NE, Suite 2
Salem, OR 97301-4173
(503) 986-3308
Laura.L.Hansen@odot.state.or.us

Laura Wipper
Performance Management Consultant
Audit Services Division
355 Capitol Street NE, Rm. 14
Salem, OR 97301
(503) 986-4092
Laura.R.Wipper@odot.state.or.us

Websites:

- ODOT, Roadway Engineering:
  http://www.oregon.gov/ODOT/HWY/ENGSERVICES/index.shtml
- Transportation Development Division
  ODOT intranet link: *http://intranet.odot.state.or.us/tdb/index.htm*
  ODOT internet link: *http://www.oregon.gov/ODOT/TD/UnderConstruction.shtml*
- Road Inventory and Classification Services Unit: website at:
  http://www.oregon.gov/ODOT/TD/TDATA/TDATA_All_Contacts.shtml#Road_Inventory___Classification_Services
- Transviewer – Highway Inventory Summary Reports:
  http://highway.intranet.odot.state.or.us/cf/highwayReports/aml_summary_parms_by_route_no.cfm
- Federal Highway Administration (FHWA):
  http://safety.fhwa.dot.gov/roadway_dept/road_hardware/road_policies.htm
- ODOT Travel Guide is useful for planning trips:
  http://www.tripcheck.com/

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Appendix A

Commonly Used Terms

Longitudinal Barrier – A barrier designed to prevent penetration and safely redirect an errant vehicle away from a roadside or median hazard.

Median Barrier – A roadside barrier designed to protect against median crossover head-on crashes.

Module – An independent unit set inside an impact attenuator that can be easily rearranged, replaced or interchanged as needed.

Strut – A rigid structural member used as a support.

Telescope – Refers to the contracting motion that takes place when the sections of an impact attenuator slide neatly, one inside another, like the sections of a telescope.

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Appendix B

Asset Data Collection Registry

Purpose:

ODOT's responsibility for managing billions of dollars in linear transportation assets has taken a more strategic direction to address the state-wide issues of an aging infrastructure coupled with limited resources. Data used to manage ODOT's assets are stored in and retrieved from nearly 100 different databases and programs. To assist in coordinating the organization wide data collection efforts, this database has been developed. It's purpose is to help ODOT understand what asset information is being collected, by whom and to reduce duplicate efforts whenever possible.

Entry Instructions:

The first step is to enter your project information into the Asset Data Collection Registry (ADCR), which can be found at *http://highway.intranet.odot.state.or.us/cf/ADCR/.*

The ADCR is divided into two sections. The first portion collects contact information and the second portion collects information pertaining to the field inventory effort.

To enter a new record in the registry simply select the **ADD** button on the main page under ADD RECORD or select Add Record from the navigation bar on the left and start filling in the form. When you are finished select the **Submit** button and your information will be saved to the database.

Drop down boxes have been provided for various fields to make entering data easier. If you do not see what you are looking for in one of these drop downs, please select **Other** at the bottom of the list and add the information to the additional information box.

There are also three text boxes you can enter data into, the Location of Project, Purpose of Collection and Additional Information. Please try to keep these descriptions as brief as possible.

Search for Existing Inventories:

For your convenience, the search function for existing inventories has been divided into three options. However, you can only select one type at a time for your search. To begin your search, select from **Search by Organization**, **Search by Asset** or **Search by Storage Type**, then select the **View** button. This will take you to a new window that will list all of the inventories that meet search criteria. Simply select one of the Contact Names and you will see the report for that inventory. Use the back button in the upper left of the web page to go back one window.

If you wish to go back to the main page, you can select the **ODOT Asset Data Collection Registry** at the top of the page or the **Version 1.0.0.7** at the bottom of the page. This will work for any of the ADCR pages.

The database has been constructed so that you are required to enter a minimum number of mandatory fields. If you do not enter information into this minimum set of fields, you will not be able to save your information to the database. Mandatory fields are indicated with a red asterisk

For questions please contact: Asset Management Analyst (503) 986-3157.

The following is an example of a form that has been filled out online:

ASSET MANAGEMENT'S

ASSET DATA COLLECTION REGISTRY

9 - 9 of 15

* Contact's Last Name:	Spaulding
* Contact's First Name:	Danny
* Contact's Phone Number:	(503) 986-4182
* Contact's Email Address:	*danny.g.spaulding@odot.state.or.us*
* Organization Name:	Transportation Development Division
* Approving Manager Last Name:	King
* Approving Manager First Name:	Heather
* Approving Manager's Phone Number:	(503) 986-4157
* Approving Manager's Email Address:	heather.l.king@odot.state.or.us

* Asset|Road Features No.1:	Video Log (DVL)
Asset|Road Features No.2:	
Asset|Road Features No.3:	
Asset|Road Features No.4:	
Who will perform the work:	ODOT Personnel
Contractor Name:	
Location of Project:	All state highways
Region:	
District:	
Highway Name:	
Beginning MilePoint:	
Ending MilePoint:	
Project Schedule:	Annual
Project Begin Date:	
Project End Date:	
Collection Method:	DMI
Storage Type:	SQL Server
Purpose of Collection	Video Log of all State Highways which can be used to collect or verify field data without having to travel to the field.
Additional Information:	Digital images collected by two cameras every 26.4 feet. Images from 1999 to present are available for viewing on the web. Video Library subscriptions of DVDs of continuous video are also available.

Data Entry Date: 24-Sep-07

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Appendix C

Roadside Barrier Data Collection Sheet

Route Number	ODOT Highway Number	Roadway ID	Mileage Type	Ovlap_mlge_cd	Beginning Mile Point (to 100th)	Ending Mile Point (to 100th)	Side of Road (R/L/C)	Beg_Term_Type	Beg_Term_Height (L, O, H)	Beg_Term_Cond (G, F, P)	Rail_Type	Post_Spacing	Post_Type	Rail_Height (L, O, H)	Rail_Cond (G, F, P)	Cable_Bar_Type	Cable_Bar_Height (L, O, H)	Cable_Bar_Cond (G, F, P)	Bar_Type (Jersey, F, Tall F, SS)	Bar_Const_Mthd (Precast CIP)	Connection	Bar_Height (L, O, H)	Bar_Cond (G, F, P)	End_Term_Type	End_Term_Height (L, O, H)	End_Term_Cond (G, F, P)	Comments	Inventory Year

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Appendix D

State District & Region Maps

A variety of maps are available, in both electronic and hard copy version:

City Maps
County Maps
Statewide Maps
ODOT Region Maps
ODOT District Maps
Pavement Condition Maps
Seismic Lifeline Maps
SPIS/SIP Maps
Microstation Map Files
Hardcopy Printed Maps

To access, go to the following website:

http://www.oregon.gov/ODOT/TD/TDATA/gis/odotmaps.shtml#ODOT_Region_Maps

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Appendix E

Highway Inventory Summary

Below is a screen print of the web page which you will utilize to access Highway Inventory Summary Reports. As you can see there are several different ways to search for a report; by route, by highway, or by district. Only the search by highway is addressed here.

You can choose to search by either the highway name or the highway number. Once you have selected the appropriate highway all you need to do is click on the search arrow in the upper left corner of the "Search by Highway" section and a list of information about the entire stretch of highway will pop up in a new window. However, you may choose to narrow your search by entering in the milepoints for the segment of road you are inventorying. You could also narrow, or even expand, your search by checking or un-checking the boxes below under "Road Type," "Roadway ID," and "Mileage Type." ***Note:*** When you need a report containing ramp information, be sure to check the "Connections" box.

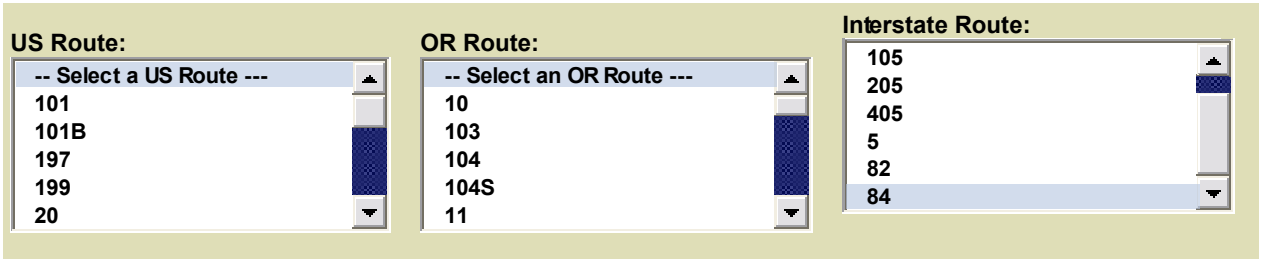
The following web page can be accessed with the following web link: *http://highway.intranet.odot.state.or.us/cf/highwayReports/aml_summary_parms_by_route_no.cfm*

Highway Inventory Summary

You can now search by route, highway or district.

Search by Signed Route

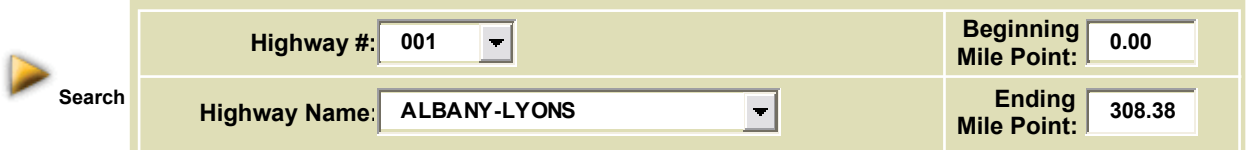
1. Select either a US or OR or Interstate Route from the pulldown boxes below.



Search by Highway

The Highway numbers seen below are the ODOT highway numbers. These numbers are not what you would see on road side signs when driving on our highways.
For those not familiar with our highway numbering system there is a *Highway Cross Reference Table* available.

1. Select a highway.



Road Type	Roadway ID	Mileage Type
☑ Highways	☑ 1 Primary Roadway-- add	☑ Blank- Regular
☐ Connections	☑ 2 Primary Roadway-- non add	☑ T - Temporary
☐ Frontage Roads	☑ 3 Split Roadway-- add	☑ Y - Spur
	☑ 4 Split Roadway-- non add	☑ Z - Overlap
	☑ 5 Located Line	

Search by District

1. Select a district.

Search **District:** 01

This section is maintained by the *ODOT RICS Unit.*
For change requests and questions or to report problems with this application, contact the *ODOT RICS Unit.*

Appendix F

List of Routes Cross-Referenced with Highway Numbers & Highway Names

ODOT Hwy No. (rd_id)	**Hwy Name (rd_name)**	**Routes**
001	PACIFIC	I-5 OR138 OR99 OR99E US30
002	COLUMBIA RIVER	I-84 US30 US395 US730
003	OSWEGO	OR43
004	THE DALLES-CALIFORNIA	OR216 US197 US26 US30 US97
005	JOHN DAY	OR19 OR206 OR207 US26 US395
006	OLD OREGON TRAIL	I-84 OR203 US30 US395
007	CENTRAL OREGON	OR201 US20 US26 US395
008	OREGON-WASHINGTON	OR11 US30
009	OREGON COAST	OR255 US101
010	WALLOWA LAKE	OR82
011	ENTERPRISE-LEWISTON	OR3
012	BAKER-COPPERFIELD	I-84 OR7 OR86 OR86S
014	CROOKED RIVER	OR27
015	MCKENZIE	OR126 OR126B OR242 US20
016	SANTIAM	OR126 US20
017	MCKENZIE-BEND	US20 US97B
018	WILLAMETTE	OR58 OR99
019	FREMONT	OR140 OR31 US395
020	KLAMATH FALLS-LAKEVIEW	OR140 OR39 US97B
021	GREEN SPRINGS	OR140 OR66
022	CRATER LAKE	OR62
023	DAIRY-BONANZA	OR70
025	REDWOOD	OR99 US199
026	MT. HOOD	OR35 US26
027	ALSEA	OR34
028	PENDLETON-JOHN DAY	OR37 US395
029	TUALATIN VALLEY	OR47 OR8
030	WILLAMINA-SALEM	OR22
031	ALBANY-CORVALLIS	US20
032	THREE RIVERS	OR22
033	CORVALLIS-NEWPORT	OR34 US20
035	COOS BAY-ROSEBURG	OR42 OR99
036	PENDLETON-COLD SPRINGS	OR37
037	WILSON RIVER	OR6

038	OREGON CAVES	OR46
039	SALMON RIVER	OR18 OR22 OR233
040	BEAVERTON-HILLSDALE	OR10
041	OCHOCO	OR126 US26
042	SHERMAN	US97
043	MONMOUTH-INDEPENDENCE	OR51
044	WAPINITIA	OR216
045	UMPQUA	OR38 OR99
046	NECANICUM	OR53
047	SUNSET	OR47 US26
048	JOHN DAY-BURNS	US395
049	LAKEVIEW-BURNS	US395
050	KLAMATH FALLS-MALIN	OR140 OR39 US97B
051	WILSONVILLE-HUBBARD	OR551
052	HEPPNER	OR207 OR74
053	WARM SPRINGS	US26
054	UMATILLA-STANFIELD	US395
058	ALBANY-JUNCTION CITY	OR99E US20
060	ROGUE RIVER	OR99
061	STADIUM FREEWAY	I-405 US26 US30
062	FLORENCE-EUGENE	OR126
063	ROGUE VALLEY	OR99
064	EAST PORTLAND FREEWAY	I-205 OR213 OR224
066	LA GRANDE-BAKER	OR203 OR237 OR7 US30
067	PENDLETON	OR11 OR37 US30
068	CASCADE HWY NORTH	OR213
069	BELTLINE	OR126 OR569
070	MCNARY	I-82 US395
071	WHITNEY	OR7
072	SALEM	OR22 OR99EB
081	PACIFIC HIGHWAY EAST	OR214 OR99E
091	PACIFIC HIGHWAY WEST	OR10 OR126 OR126B OR219 OR34 OR99 OR99W US20
092	LOWER COLUMBIA RIVER	US30
100	HISTORIC COLUMBIA RIVER	I-84 OR35 US30
102	NEHALEM	OR202 OR47 US101B US26
103	FISHHAWK FALLS	OR103
104	FORT STEVENS	OR104 OR104S
105	WARRENTON-ASTORIA	US101B
110	MIST-CLATSKANIE	OR47
120	SWIFT	OR120

123	NORTHEAST PORTLAND	US30BY
130	LITTLE NESTUCCA	OR130
131	NETARTS	OR131
138	NORTH UMPQUA	OR138 OR99
140	HILLSBORO-SILVERTON	OR214 OR219 OR99E OR99W
141	BEAVERTON-TUALATIN	OR141
142	FARMINGTON	OR10
143	SCHOLLS	OR210
144	BEAVERTON-TIGARD	OR217
150	SALEM-DAYTON	OR221
151	YAMHILL-NEWBERG	OR240
153	BELLEVUE-HOPEWELL	OR153 OR99W
154	LAFAYETTE	OR154 OR233
155	AMITY-DAYTON	OR233
157	WILLAMINA-SHERIDAN	OR18B
160	CASCADE HWY SOUTH	OR213
161	WOODBURN-ESTACADA	OR211
162	NORTH SANTIAM	OR22
163	SILVER CREEK FALLS	OR214
164	JEFFERSON	OR164
171	CLACKAMAS	I-205 OR211 OR212 OR213 OR224
172	EAGLE CREEK-SANDY	OR211
173	TIMBERLINE	OR173
174	CLACKAMAS-BORING	OR212
180	EDDYVILLE-BLODGETT	OR180
181	SILETZ	OR229
189	DALLAS-RICKREALL	OR223
191	KINGS VALLEY	OR223
193	INDEPENDENCE	OR51
194	MONMOUTH	OR194
200	TERRITORIAL	OR200 OR36
201	ALSEA-DEADWOOD	OR501
210	CORVALLIS-LEBANON	OR34 US20
211	ALBANY-LYONS	OR226
212	HALSEY-SWEET HOME	OR228
215	CLEAR LAKE-BELKNAP SPRINGS	OR126
222	SPRINGFIELD-CRESWELL	OR222
225	MCVAY	OR225
226	GOSHEN-DIVIDE	OR99
227	EUGENE-SPRINGFIELD	I-105 OR126

228	SPRINGFIELD	OR528
229	MAPLETON-JUNCTION CITY	OR36
230	TILLER-TRAIL	OR227
231	ELKTON-SUTHERLIN	OR138
233	WEST DIAMOND LAKE	OR230
240	CAPE ARAGO	OR540
241	COOS RIVER	OR241
242	POWERS	OR542
244	COQUILLE-BANDON	OR42S
250	CAPE BLANCO	OR250
251	PORT ORFORD	OR251
255	CARPENTERVILLE	OR255 US101
260	ROGUE RIVER LOOP	OR260
270	LAKE OF THE WOODS	OR140
271	SAMS VALLEY	OR234 OR99
272	JACKSONVILLE	OR238
273	SISKIYOU	OR273
281	HOOD RIVER	OR281
282	ODELL	OR282
290	SHERARS BRIDGE	OR216
291	SHANIKO-FOSSIL	OR218
292	MOSIER-THE DALLES	US30
293	ANTELOPE	OR293
300	WASCO-HEPPNER	OR19 OR206 OR207
301	CELILO-WASCO	OR206
320	LEXINGTON-ECHO	OR207
321	HEPPNER-SPRAY	OR207
330	WESTON-ELGIN	OR204
331	UMATILLA MISSION	OR331
332	SUNNYSIDE-UMAPINE	OR332
333	HERMISTON	OR207
334	ATHENA-HOLDMAN	OR334
335	HAVANA-HELIX	OR335
339	FREEWATER	OR339
340	MEDICAL SPRINGS	OR203
341	UKIAH-HILGARD	OR244
342	COVE	OR237
350	LITTLE SHEEP CREEK	OR350
351	JOSEPH-WALLOWA LAKE	OR351
360	MADRAS-PRINEVILLE	US26

361	CULVER	OR361
370	O'NEIL	OR370
380	PAULINA	OR380
390	SERVICE CREEK-MITCHELL	OR207
402	KIMBERLY-LONG CREEK	OR402
410	SUMPTER	OR410
413	HALFWAY-CORNUCOPIA	OR413
414	PINE CREEK	OR414
415	DOOLEY MOUNTAIN	OR245
422	CHILOQUIN	OR422 OR422S
424	SOUTH KLAMATH FALLS	OR140
426	HATFIELD	OR39
429	CRESCENT LAKE	OR429
431	WARNER	OR140
440	FRENCHGLEN	OR205
442	STEENS	OR78
449	HUNTINGTON	US30
450	SUCCOR CREEK	OR201 OR452
451	VALE-WEST	OR451
453	ADRIAN-ARENA VALLEY	OR453
454	ADRIAN-CALDWELL	OR454
455	OLDS FERRY-ONTARIO	OR201 OR52 US30 US30B US95S

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Appendix G

Common Alignment Highway Report

The following is a list of the highways that share a common alignment. Remember, the common alignment mileage is chargeable to the lower numbered highway.

This report is produced by Road Inventory and Classification Services at ODOT, and can be accessed by visiting the following website, and placing a checkmark in the box next to "1 Common Alignment": *http://highway.odot.state.or.us/cf/highwayreports/exclude_parms.cfm*

Common Alignment Report

HWY	Highway Name	Rdwy ID	Dir	Mlge Type	Begin MP	End MP	Length
002	COLUMBIA RIVER	1	E		35.63	43.38	7.75
100	HISTORIC COLUMBIA RIVER	1	E		22.25	30.00	7.75
002	COLUMBIA RIVER	1	E		47.62	61.81	14.19
100	HISTORIC COLUMBIA RIVER	1	E		34.49	48.68	14.19
002	COLUMBIA RIVER	2	E		35.58	43.11	7.53
100	HISTORIC COLUMBIA RIVER	2	E		22.18	29.71	7.53
002	COLUMBIA RIVER	2	E		47.61	61.76	14.15
100	HISTORIC COLUMBIA RIVER	2	E		34.51	48.66	14.15
005	JOHN DAY	1	S		38.07	38.27	0.20
300	WASCO-HEPPNER	1	E		40.68	40.88	0.20
006	OLD OREGON TRAIL	1	E		302.98	303.88	0.90
012	BAKER-COPPERFIELD	2	E		1.42	2.32	0.90
006	OLD OREGON TRAIL	2	E		302.94	303.80	0.86
012	BAKER-COPPERFIELD	1	E		1.57	2.43	0.86
008	OREGON-WASHINGTON	1	E		-0.70	0.00	0.70
067	PENDLETON	1	E		3.92	4.62	0.70
009	OREGON COAST	1	S		337.97	339.71	1.74
255	CARPENTERVILLE	1	S		339.68	341.22	1.54

Common Alignment Report

HWY	Highway Name	Rdwy ID	Dir	Mlge Type	Begin MP	End MP	Length
020	KLAMATH FALLS-LAKEVIEW	1	E		3.28	5.54	2.26
050	KLAMATH FALLS-MALIN	1	E		-2.24	0.00	2.24
047	SUNSET	1	E		45.41	49.28	3.87
102	NEHALEM	1	S		76.96	80.83	3.87
064	EAST PORTLAND FREEWAY	1	N		12.94	13.11	0.17
171	CLACKAMAS	2	E		4.73	4.90	0.17
064	EAST PORTLAND FREEWAY	2	N		12.63	13.18	0.55
171	CLACKAMAS	1	E		4.36	4.91	0.55
081	PACIFIC HIGHWAY EAST	1	S		31.70	32.87	1.17
140	HILLSBORO-SILVERTON	1	S		39.29	40.46	1.17
091	PACIFIC HIGHWAY WEST	1	S		22.89	23.20	0.31
140	HILLSBORO-SILVERTON	1	S		20.42	20.73	0.31
091	PACIFIC HIGHWAY WEST	1	S		23.20	23.31	0.11
140	HILLSBORO-SILVERTON	2	S		20.15	20.37	0.22
091	PACIFIC HIGHWAY WEST	1	S		23.34	23.45	0.11
140	HILLSBORO-SILVERTON	2	S		20.15	20.37	0.22
091	PACIFIC HIGHWAY WEST	1	S		44.68	44.75	0.07
153	BELLEVUE-HOPEWELL	1	E		6.23	6.30	0.07
091	PACIFIC HIGHWAY WEST	2	S		23.18	23.41	0.23
140	HILLSBORO-SILVERTON	1	S		20.19	20.42	0.23
200	TERRITORIAL	1	S		8.62	10.08	1.46
229	MAPLETON-JUNCTION CITY	1	E		45.95	47.41	1.46
334	ATHENA-HOLDMAN	1	S		8.44	9.57	1.13
335	HAVANA-HELIX	1	S		2.40	3.53	1.13
Total Length:							**59.46**

Appendix H

FHWA Standards

ODOT's Roadway Engineering in collaboration with ODOT Audit Services developed the following general assessment of functional condition based on the following criteria for classification:

- **Good** – Meets current, crash test standards.
- **Fair** – Does not meet current standards, but the device is acceptable to leave in place.
- **Poor** – Does not meet the current standards and must be replaced.

Traffic Barrier Functional Conditions

Good

1 - Meets: Height and Length of Need

2 - Good Condition

3 - 350 Compliant

Fair

1 - Meets: Height and Length of Need

2 - Fair Condition

3 - 230 Compliant, but not 350 Compliant

Poor

1 - Does not meet: Height or Length of Need

2 - Poor Condition

3 - Not 230 or 350 Compliant

Terminal and Impact Attenuator Functional Conditions

Good

1 - Good Condition

2 - 350 Compliant

Fair

1 - Fair Condition

2 - 230 Compliant, but not 350 Compliant

Poor

1 - Poor Condition

2 - Not 230 or 350 Compliant

350 Compliant – 230 Compliant – Not 230 Compliant Definitions

350 Compliant

Type 2A Guardrail Spacing

Guardrail Terminals -	SKT FLEAT SRT BIBS ET2000
Impact Attenuators -	REACT CAT Brakemaster RACC Quadgard – wide or narrow
Concrete Barrier Connections -	C channel bolted connection – Tall F & Single Slope 6 loop pin & loop

230 Compliant

Impact Attenuators -	GREAT Hexfoam Sandwich
Concrete Barrier Connections -	4 loop pin & loop

Not 230 Compliant

Post Spacing -	Type 1, Type 1A, Type 2
Guardrail Terminals -	Blunt A Blunt B Blunt C BCT Texas Twist or Turned down w/no twist
Rail Type -	Half Moon, Flying W
Impact Attenuators -	Hydro Sandwich
Concrete Barrier Connections -	Tongue & Groove

Remember: This information is current as of August 2008, however, these standards are changing frequently. For more information visit the following webpage on FHWA's website: *http://safety.fhwa.dot.gov/roadway_dept/road_hardware/road_policies.htm*

Appendix I

Abbreviations For Data Entry

	Term	Abbreviation
Side of Road	Left	L
	Right	R
	Center	C
Terminal Type	None	None
	Sloped End Unburied	Sloped End
	Connected to Structure	Conn. to structure
	Buried in Mound	Mound
	(Buried in Back Slope)	BIBS
	Blunt A	Blunt A
	Blunt B	Blunt B
	Blunt C	Blunt C
	BCT (Breakaway Cable Terminal)	BCT
	Turned Down End (Texas Twist)	TDE
	ET 2000	ET 2000
	SKT	SKT
	FLEAT	FLEAT
	SRT	SRT
	Other	Other
	IA-SENTRE	IA-SENTRE
	IA- Sand Barrels	IA-Sand Barrels
	IA-Hi-Dro Sandwich	IA-Hi-Dro Sandwich
	IA-QuadGuard (Narrow or Wide)	IA-QG
	IA-QuadGuard Elite	IA-QGE
	IA-QuadTrend	IA-QT
	IA-BrakeMaster	IA-BrakeMaster
	IA-REACT	IA-REACT
	IA-CAT 350	IA-CAT
	IA-TRACC	IA-TRACC
	IA-SCI 100 GM	IA-SCI 100
	IA-Hexfoam Sandwich	IA-Hexfoam Sandwich
	IA-GREAT	IA-GREAT
	IA-QUEST	IA-QUEST
	IA-TAU II (Narrow or Wide)	IA-TAU II
	IA-Other	IA-Other
	Tran-Pre 230	Tran-Pre 230
	Tran-230	Tran-230
	Tran-350	Tran-350
	Tran-CB/GR	Tran-CB/GR
	Continues down offramp	Cont. down offramp
	Continues down side road	Cont. down side road
	Continued from onramp	Cont. from onramp
	Continued from side road	Cont. from side road

Terminal Height	Low	L
	OK	O
	High	H
Terminal Condition	Good	G
	Fair	F
	Poor	P
Rail Type	W Beam Galvanized	Galv.
	W Beam Painted	Paint
	W Beam CORTEN	CORTEN
	W Beam w/Rubrail	Galv. w/Rubrail
	Half Moon	Half Moon
	Flying W	Flying W
	Thrie	Thrie
	Modified Thrie	Mod. Thrie
	Round Timber	Timber
	Steel Backed Timer	SBT
	Two Rail Steel Backed Timer	Two Rail SBT
	Other	Other
Post Spacing	Type 1	1
	Type 1A	1A
	Type 2	2
	Type 2A	2A
	Other	Other
Post Type	Wood	Wood
	Steel	Steel
	Concrete	Concrete
Rail Height	Low	L
	OK	O
	High	H
Rail Condition	Good	G
	Fair	F
	Poor	P
Cable Barrier Type	3-Strand	3-Strand
	4-Strand	4-Strand
Cable Barrier Height	Low	L
	OK	O
	High	H
Cable Barrier Condition	Good	G
	Fair	F
	Poor	P
Concrete Barrier Type	Jersey	Jersey
	F Shape	F
	Tall F	Tall F
	Single Slope	SS
	Other	Other

Concrete Barrier Construction Method	Precast	Precast
	Cast in Place	CIP
Concrete Barrier Connection	Tongue & Groove	T & G
	4 Pin & Loop	4 P & L
	6 Pin & Loop	6 P & L
	C Channel	C Channel
Concrete Barrier Height	Low	L
	OK	O
	High	H
Concrete Barrier Condition	Good	G
	Fair	F
	Poor	P

Comments
Inventory Year